APPENDIX A
ISSUE DISPOSITION SUMMARY

The National Environmental Policy Act provides for identification and elimination from detailed study those issues which are not significant or which have been covered by prior environmental review, thus narrowing the discussion of those issues to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere (40 CFR 1501.7(3)).

Scoping identified a total of 35 issues that could be relevant to the proposed timber sale. Each issue was considered by the appropriate ID team member to determine its disposition (how/if it is related to the project under the proposed action and the level of potential impact). As a result, each issue was classified into one of the following categories: 1) dismiss as irrelevant; 2) dismiss as outside or beyond the scope of the project; 3) eliminate from detailed study due to known minor or no effects; 4) eliminate from detailed study due to effective mitigation or project design; or 5) list and treat as a significant issue.

The issues and their disposition in this EA are summarized below. Some issues are discussed in greater detail at various places in the document. Cross-references are provided.

1. Grizzly Bear: The proposed harvest, road development, and post-harvest activities are located in grizzly bear habitat. This issue consists of eight subissues: 1) loss of foraging habitat; 2) changes in hiding and security cover; 3) increased potential for bear mortalities; 4) population viability; 5) changes in denning habitat; 6) changes in prey base; 7) increased availability of human attractants; and 8) the effects of this project in concert with other known private and State activities.

> ***Significant*:** See the discussion on grizzly bears in *Chapter 3-3*. Also, a detailed analysis of the preferred alternative is in *Appendix C, Biological Assessment*.

2. Ungulates: Ungulates (such as elk, mule deer, and moose) are a part of the prey base for the threatened grizzly bear. This project is located within grizzly bear habitat and may affect ungulate security, hiding and thermal cover, foraging habitat, migration/travel routes**,** and population vaibility, and therefore, may indirectly affect grizzly bears. There is also a concern that existing open road density (and projected road density following harvest) may not meet the Forest Plan standard for Elk Effective Cover (Habitat Effectiveness Index- HEI).

> ***Significant*:** This issue is considered significant due to its potential indirect effects on grizzly bears. See detailed discussion of the issue in *Chapter 3-12*. A detailed analysis of the preferred alternative is also in *Appendix C, Biological Assessment*.

3. Economics: The primary purpose of the project is to raise revenue from the sale of timber to repay the loan that was necessary to complete the purchase important land in the Taylor Fork drainage. One of the measures of achievement of this purpose is calculation of Present Net Value for the alternatives. There is concern the project will not be economically feasible or cost efficient. This relates to Planning Criterion 15. The costs of the project (including nonmonetary costs) may exceed the benefits associated with achieving the project's purpose and need.

> ***Significant*:** This issue is a key decision factor. See the detailed discussion of this issue in *Chapter 3-17*.

4. Vegetative Diversity: The Forest-wide standard for vegetative diversity (FP standard 6.c., pg. II-19 and 20), states; "(1) Forest lands and other vegetative communities such as grassland, aspen, sagebrush and whitebark pine will be managed by prescribed fire and other methods to produce and maintain the desired vegetative conditions; (2) In order to achieve size and age diversity of vegetation, the Forest will strive to develop the following successional stages in timber compartments containing suitable timber: 10% grass-forb, 10% seedling/sapling, 10% pole, 10% mature, and 10% old growth.

***Significant*:** Currently, the project analysis area does not meet the Forest Plan standard. The present vegetative condition is above the standard in older aged forests (62% mature and old growth) and below the standard in younger aged forests: seedlings (<1%), saplings (3.4%), and pole-size (<1%) components. The proposal and other action alternatives will be unable to meet the standard. Therefore, a project-specific amendment to exempt this project from the vegetative diversity standard will be needed. An alternative that avoids the need for a Forest Plan amendment was considered (See *Chapter 2-35, Alternatives Considered but Eliminated from Detailed Study*). See the discussion of this issue in *Chapter 3-21.*

5. Firewood Availability: The proposed timber harvesting and road management may affect the availability of firewood for the local Gardiner community.

***Significant*:** This issue is of interest to the local community. See detailed discussion of this issue in *Chapter 3-23.*

6. Small Local Timber Operations: The proposed timber harvesting may reduce the availability of trees for local small timber or sawmill operators.

Significant. This issue is of interest to the local community. See detailed discussion of this issue in *Chapter 3-24*

7. Openings Exceeding 40 Acres: The Gallatin Forest Plan and NFMA regulations require created openings in the forest to be no larger than 40 acres unless a waiver is approved by the Regional Forester or other circumstances are present that warrant exceeding 40 acres. Creating openings larger than 40 acres may affect wildlife (e.g., loss of cover habitat and large opening size effects on elk, grizzly bear, sensitive wildlife, Mangement Indicator Species, and others).

***Significant*:** Alternatives B (proposed action) and C exceed the 40-acre size limit. Alternatives D and D-Modified (preferred) were developed to meet this requirement. See the discussion of this issue in Chapter 2-4 and the comparison of effects among the various alternatives in Chapter 2-31 and in Chapter 3-26.

8. Other Threatened, Endangered, and Proposed Species: The proposed harvest, road development, and post-harvest activities may affect threatened, endangered, and candidate species or their habitat. This includes the threatened Canada lynx, threatened bald eagle, and the nonessential experimental population of gray wolves.

Eliminated due to minor or no effects: Implementing any of the action alternatives will have "no effect" on the threatened bald eagle. *See Appendix C-37*.. In addition, they are "not likely to jeopardize the continued existence" of the nonessential, experimental gray wolf. See *Appendix C-35* Although the action alternatives "are not likely to adversely affect the threatened lynx", they will alter suitable habitat for this species. Alternative D-modified (preferred alternative) would result in a short-term loss of 195 acres of lynx foraging habitat with the other action alternatives reflecting a greater loss. Several decades post-harvest, these areas would provide better lynx foraging opportunities than pre-harvest conditions because snowshoe hares, part ot the lynx prey base, are useually more adundant in early seral stages. A detailed analysis of the preferred alternative and potential affects to Canada lynx is in *Appendix C-38, Biological Assessment*.

9. Sensitive Fish and Wildlife Species: The proposed harvest, road development, and post-harvest activities may affect wildlife species listed as "sensitive" by the Forest Service. Listed species include westslope cutthrout trout, Yellowstone cutthroat trout, Montana arctic grayling, peregrine falcon, northern goshawk, trumpeter swan, harlequin duck, western big-eared bat, flammulated owl, black-backed woodpecker, wolverine, northern leapord frog, and boreal toad. Animals may be displaced because of their intolerance of human activity and/or habitat may be physically altered. The potential for mortalities may increase. Food sources may be affected. The loss of individuals or population segments may reduce the viability of populations or cause a trend towards Federal listing under the Endangered Species Act.

Eliminated due to known minor or no effects. Of the 13 fish and wildlife species listed for the Gallatin Forest, 8 are potentially present in the analysis area. Trumpeter swan, western big-eared bat, and flammulated owl were not included in the remainder of the analysis, primarily because of habitat limitations. Westslope cutthroat trout and Montana arctic grayling were not included because they are not present; the analysis area is outside of their historic range. Potential effects to sensitive species are summarized below. A detailed discussion can be found in *Appendix B, Biological Evaluation*.

Yellowstone cutthroat trout: Alternative A would not generate sediment or changes in riparian habitat or the hydrologic balance of area streams. Therefore, it would result in "no impact" to Yellowstone cutthroat trout. All action alternatives would have "no impact" because of the following reasons: 1) existing sediment concentrations are low and estimated increases do not cause concentrations to exceed the 90% habitat objective; 2) the channel types are resilient to sediment increases and increases are expected to be minor; 3) there will be no riparian harvest effects; 4) the water yield increase over natural conditions would be considerably below measurable levels and would not result in stream channel scour. Existing channel stability ratings and habitat survey data suggest that channel changes via hydrologic imbalance (e.g., bank erosion, scour, changes in channel morphology) from previous timber sales is not occurring and channels show no signs of alteration (Story 1999). Furthermore, all channel types within the analysis area have very low sensitivity to changes in streamflow or sediment discharge. In addition, the silvicultural prescriptions call for partial cuts in most of the units, which leaves varying percentages of trees to offset potential flow increases and related habitat effects. Thus, the determination is that there is no potential to alter hydrologic balance or cause habitat degradation and "no impact" would occur. *See Appendix B-8.*

Peregrine falcon: Suitable cliffs for nesting and good foraging habitat are present in the lowest elevations of Bear Creek. However, no nests have been reported there. Moreover, these potential eyrie locations are not within the portion of the analysis area designated suitable for timber harvesting. Specifically, the project site does not offer nesting or foraging habitat for peregrines. Implementing any of the alternatives would have "no impact" on this species. *See Appendix B-9*

Northern goshawk: The analysis area contains about 2,743 acres of foraging habitat and 52 acres of nesting habitat. Suitable habitat is primarily in the central part of the Bear Creek drainage and corresponds with the drier Douglas fir forests. No nests have been found in the analysis area, including the area proposed for timber harvesting. However, it is assumed nests exist in the Bear Creek drainage because of positive responses by individual birds to vocalization surveys. Timber harvesting would reduce the amount of suitable goshawk foraging habitat by 15 to 37 acres. No nesting habitat would be affected. Alternative D-modified (preferred) would have the least effect. None of the alternatives would compromise the opportunity for goshawks to nest in the Bear Creek drainage or the viability of this species at the broader scale. Therefore, it is reasonable to conclude that the project "may impact individuals or habitat, but will not likely contribute to a trend towards listing or loss of viability to the population or species*". See Appendix B-9*

Harlequin duck: Suitable habitat for harlequin ducks is present along Bear Creek. However, it is nonexistent in the proposed harvest units. Implementing any of the alternatives would have "no impact" on this species. *See Appendix B-9*

Black-backed woodpecker: Suitable habitat is present in the analysis area. Although past timber harvesting has reduced the availability of snags, the majority of mature forests in the drainage are still intact. Many large fires between 1988 and 2003 involving the Gallatin Forest and nearby Yellowstone Park have created abundant habitat for this species. Current beetle infestations throughout the GYA, including Bear Creek, are providing additional habitat progressively. Implementing the action alternatives would reduce the amount of snags potentially available to black-backed wood peckers in the analysis area by removing between 195-499 acres of mature forest. Alternative D-modified would affect the least number of acres of suitable habitat. Because of the abundance of habitat at a landscape level and the lack of confirmed sightings of black-backed wood peckers in the analysis area, it is reasonable to assume that this project "may impact individuals or habitat, but will not likely contribtue to a trend towards listing or loss of viability to the population or species*". See Appendix B-9*

Wolverine: Wolverines are present across the Gardiner District, but numbers are unknown. There are an estimated 13,115 acres of suitable denning habitat present in the analysis area. Mature timber is important to wolverine, but they also use a wide variety of other types of habitat. Harvested areas in a matrix of mature timber may enhance wolverine foraging areas by providing suitable habitat for snowshoe hare and other potential prey. For example, in several decades, logged areas will provide productive habitat for snowshoe hare. In addition, wolverine presence and distribution seems more dependent upon the absence of humans and the location of carrion than vegetative structure.

The project will not substantially affect carrion availability, but it would affect human use levels in the short-term. Harvest activities would occur for 3 years during summer months. Given the extensive ranges of wolverines and the

proximity of large expanses of remote areas in the Absaroka Beartooth Wilderness and Yellowstone National Park, it is unlikely that human use associated with this project would significantly affect this species.

All of the action alternatives would effect wolverine habitat, but alternative D-Modified would have the least impact. It may decrease potential denning habitat by about 57 acres. By contrast, alternative B would remove 95 acres of denning habitat. Because the project has the potential to decrease wolverine denning habitat and hiding cover, and increase human activity in the short term, the determination for this species is that the project "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or a loss of vaibility to the population or species*". See Appendix B-9*

Northern Leopard Frog and Boreal Toad: Habitat is limited for these species in the analyis area and no individuals have been sighted. The project is designed to avoid riparian areas, thus precluding impacts to suitable habitat for amphibians. Implementing any of the proposed alternatives would have "no impact" on these species. *See Appendix B-9.*

10. **Sensitive Plants:** The proposed harvest, road development, and post-harvest activities may affect individuals or the habitat of plant species listed as "sensitive" by the Forest Service. Removing vegetative cover or disturbing soil may destroy sensitive plant populations or alter their habitats. Any changes may affect the population's viability or cause a trend towards Federal listing under the Endangered Species Act.

    Eliminated due to minor or no effects: Of the 21 plant species listed for the GNF, habitat for 13 of these may exist in the area proposed for timber harvesting. Project effects analysis was not conducted for the remaining 8. No sensitive plants were found in any of the proposed timber sale units during surveys. There are several wet areas that offer suitable habitat for some sensitive plant species. However, there are few such sites and they are comparatively very small. No sensitive species were found at these locations (Hoffman 1998). Many of the proposed harvest units have potential habitat for *Goodyera repens*. However, this species was not found, nor was *G. oblongifolia*, a common related species. For the 13 species with habitat potentially present, the action alternatives "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species."

    Although no sensitive plants were found in the proposed harvest units, logging will radically alter the environment in these areas. This will result in the loss of potential habitat. With the exception of *Goodyera repens*, this is not consequential because the amount of suitable habitat for the respective species is limited in the areas potentially affected. See *AppendixB -5, Biological Evaluation* for a detailed discussion.

11. **Management Indicator Species (Pine Marten):** The proposed timber harvest, road development, and post-harvest activities may affect management indicator species (MIS) in the Bear Creek drainage. Species are on the MIS list because they are likely to be affected by forest management activities. Therefore, they serve as indicators of habitat change. There are five terrestrial and one aquatic MIS identified for the Gallatin National Forest, and all are found within the analysis area: bald eagle, grizzly bear, elk, pine marten, northern goshawk, and Yellowstone cutthroat trout. Effects analysis for each species, except the pine marten, can be found in other portions of this document. For example, the bald eagle is discussed in *Appendix C, Biological Assessment*. Grizzly bear and elk habitat analysis can be found, respectively, under Issue 1 - Grizzly Bears and Issue 2 - Ungulates in Chapters 2 and 3 and in *Appendix C, Biological Assessment*. Yellowstone cutthroat trout and northern goshawk are discussed in *Appendix B, Biological Evaluation*. Therefore, only effects to pine marten will be addressed in this section.

    Project effects have the potential to compromise population viability for MIS species, at least at the local level. In addition, animals may be displaced because of their intolerance of human activity and/or habitat may be physically altered. The potential for mortalities may increase. Food sources may be affected.

    Eliminated due to minor or no effects. Pine marten require large areas of mature trees and a high amount of down logs and woody debris. Consequently, the proposed timber harvesting may impact pine marten foraging and

denning habitat in the Bear Creek drainage. However, effects will not compromise the viability of the local population.

The marten inhabits northern forests. Good habitat for this species includes mature old growth spruce-fir forests with a comparatively closed canopy, an understory of fallen logs and stumps, and lush shrub/forb vegetation. Home ranges may vary from 4-8 square miles for males and 1-2 square miles for females. They prey primarily on small mammals such as voles, snowshoe hare, squirrels, and mice.

Surveys for pine marten were initiated in the analysis area in January 1999 and are on-going. Methods included track-intercept transects and track-plate bait stations. Results have shown that they are common and widely distributed. Tracks have been found in all cover types, but use is less in recent clear cuts (<20 years old).

Currently, there are an estimated 25,472 acres of foraging habitat, 1,265 acres of high quality denning habitat, and 1,374 acres of moderate quality denning habitat in the analysis area (timber compartments 305 and 306). With the exception of rocky areas at high elevations and low elevation shrub/grasslands, almost all the analysis area has habitat value for martens.

Implementing any of the proposed alternatives would impact marten habitat. Alternative B would result in a loss of 7.5% of high quality denning habitat, 2.8% moderate quality denning habitat, and 1.7% optimal foraging habitat. Alternative C would result in a loss of 6.9% of the high quality denning habitat, 1.8% moderate quality denning habitat and 1.5% optimal foraging habitat. Alternative D would result in a loss of 4.5% of the high quality denning habitat, 1.8% moderate quality denning habitat, and 1.0% optimal foraging habitat. Alternative D-Modified would have the least impact. It would result in a loss of 3.5% high quality denning habitat, 1.5% moderate quality denning habitat and 0.8% optimal foraging habitat.

Recent surveys have shown that the pine marten population in the analysis area is robust. Moreover, the amount of habitat affected by the proposed timber harvesting would be comparatively small in the context of the analysis area. Consequently, the effects of implementing this project on pine marten should be minimal. In addition, while the logged areas will propably support lower densities of marten than they did before harvesting, in several decades these areas will provide good foraging opportunities as prey species numbers increase. In particular, snowshoe hare densities are typically higher in young lodgepole pine forests than in recently disturbed areas or mature forests, which is beneficial to pine marten.

The marten is susceptible to local extinction. Population size is determined by prey abundance and habitat. Marten prey populations can fluctuate widely. These oscillations are generally beyond the control of management actions. However, trapping, timber harvest, and, in some cases, fire are controllable issues that can significantly affect marten populations, especially if the effects are cumulative. However, the effects of implementing this project in concert with other local factors affecting marten populations will not compromise species viability in the analysis area.

For example, trapping in the analysis area is sporadic and is controlled by the State of Montana. Timber harvesting beyond the scope of this project is not planned for the near future. There are no prescribed fires scheduled. Adjacent drainages were severely impacted by the 1988 Yellowstone fires, but the analysis area was not affected. Other human activities in the analysis area, such as dispersed recreation do not significantly impact marten. The proposed timber sale, in combination with predicted human activities, would not compromise the Bear Creek pine marten population as long as trapping is regulated (Tyers 1999, PF 174). Because pine marten are ubiquitous across the Gardiner District and boreal forests across the GYA, species viability at the landscape level is also not in question.

12. Bison: The proposed timber harvest, road development, and post-harvest activities may affect bison.

Eliminated due to minor or no effects. This project will not negatively affect bison (Tyers 1999, PF 175). Bison use of the analysis area has been very limited for decades. The history of bison management in the area is long and involved. They are indigenous, but there is no local resident herd accessing the proposed project site. At present, the population is almost entirely restricted to Yellowstone Park. During the winter they may attempt to migrate out of the Park to the Gardiner Basin, including the analysis area. However, with a few minor exceptions, the State of

Montana does not allow free-roaming bison to exist within the State because of a concern over the potential transmission of brucellosis from bison to livestock. A notable exception are the grasslands between Eagle Creek and Little Trail Creek, an area substantially removed from the potential harvest units. It has been designated as a zone where bison are tolerated outside of YNP for a limited portion of the year. Other parameters for managing the Yellowstone bison herd have been negotiated between State and Federal agencies, and the details are available in a variety of public documents

The upper end of the analysis area, including the project site, is very marginal bison summer habitat and unsuitable winter habitat. It is unlikely they would attempt to use the areas proposed for timber removal even if they had unrestricted access. In addition, because bison are grazing animals, removing timber increases rather than decreases foraging areas.

It is a common phenomenon in the Yellowstone area for animals, including bison, to travel on plowed or groomed roads to avoid deep snow. This can alter migration routes and traditional distribution. However, this project does not involve winter timber cutting and hauling. See *Chapter 3-12, Ungulates*, for further discussion regarding ungulate migration routes.

13. Black Bear: The proposed timber harvesting may affect the black bear. Issues are similar to those listed for the grizzly bear (refer to *Chapter 3-3, Grizzly Bear,* and *Appendix C-10, Biological Assessmen*t). There is potential to impact black bear foraging opportunities and increase risk of mortalities.

Eliminated due to minor effects. Much of the discussion on the biology of grizzly bears in the Biological Assessment is also relevant for the black bear. However, the black bear is not Federally protected. The population is considered viable and is hunted under regulations administered by Montana Fish, Wildife, and Parks. Also, black bears are generally less agressive than grizzly bears and more tolerant of human activities. The number of individuals that use the analysis area is unknown. Sightings and sign of their presence are common. The State of Montana has not expressed any concern over the welfare of black bear populations in the State, southwest Montana, the Gallatin Forest, or Bear Creek.

The proposed sale units under all action alternatives are suitable black bear habitat. Removing the timber would alter the vegetation and change foraging opportunities. There is no indication of a food source at the project site that enhances habitat value beyond what the surrounding forests afford. Implementing any of the action alternatives would remove cover on the sale units. This may make black bears in the area somewhat more vulnerable to hunters. However, successful hunting of black bears is commensurate with State management goals for this species and harvest is regulated. This project would have minimal impact on this species. It would not affect the viability of the black bear population in the analysis area. adjacent drainages, or larger spatial scales. There is no indication that this project, in combination with other predictable human activities, would cause a significant impact on the black bear population (Tyers 1999, PF 178).

14. Mountain Lion: The proposed timber harvest, road development, and post-harvest activities may affect mountain lions.

Eliminated due to minor effects The mountain lion population at the State and local level is considered stable or increasing and hunting is allowed by special permit. Mountain lions are found in the analysis area and, although total numbers are unknown, the population is considered robust (Ruth, personal communication).

Timber removal would make harvest units less suitable mountain lion habitat in the short term, primarily because of the loss of cover. However, spatially, the affected area is not large enough to be consequential for this far-ranging species; especially since suitable habitat is abundant in the analysis area and the surrounding landscape. In addtition, implementing the project would have only limited effect on the ungulate prey base (see *Chapter 3-12, Ungulates* and *Appendix C-29, Biological Assessment*). Other prey species such as snowshoe hares would decrease for the next 15 to 25 years following timber harvest but then would increase as cover is restored by pole-size lodgepole pine.

Mountain lions are secretive animals that are easily displaced by human activity. This project would increase human activity during summers for up to three years while logging occurs but not in the long run. It would not result in an increase in access (see *Appendix C-6 and C-52, Biological Assessment*).

This project would have only minor impacts on mountain lions. They are wide-ranging and this project is limited to a small area. About 65% of the rest of the analysis area would remain timbered. This project would remove less than 1% of the forested area. The status of the mountain lion populations State-wide will depend on hunting quotas established by the State of Montana and the availability of prey (Tyers 1999, PF 175).

15. Squirrels: The proposed timber harvest, road development, and post-harvest activities may affect squirrels.

Eliminated due to minor effects. Squirrels would be impacted in the specific harvest units if this proposal is implemented. The number of individuals that could be involved is unknown. Effects would include removal of food sources and cover at the project sites. It would be several decades before these habitat features would be available again and longer before prime habitat would be restored in the cut-over areas. However, squirrels do not enjoy any sort of protected status or special management consideration. In addtion, suitable habitat is abundant within the analysis area, the surrounding region, and the intermountain west. Consequently, this species is ubiquitous. Therefore, there is no concern over the viability of the pine squirrel population at any relevant spatial scale. About 65% of the analysis area is forested (see *Issue 4. Vegetative Diversity Chapter 3-21*) and would continue to support squirrel populations. Each action alternative would remove less than 1% of available pine squirrel habitat (Tyers 1999, PF 175).

16. Neotropical Migratory Birds: The proposed harvest, road development, and post-harvest activities may affect neotropical migrant bird species by displacing them from their habitat because of human activity or by physically altering their habitat. For example, fragmentation of mature blocks of timber may increase the likelihood of nest parasitism, predation, and competition.

Eliminated due to minor effects. Despite widespread timber harvesting in the Rocky Mountains, relatively few studies on the effects of silvicultural practices on songbird populations have been conducted. Results vary among species. That is, clearcuts have negative effects on many forest-obligate species and positive effects on many species that use open habitats. The situation is further complicated by the fact that other species require various forest successional stages. To maintain a diversity of bird species, a diversity of vegetation types are necessary. This includes old growth, areas of recent disturbance, and stages in between. However, it is difficult to know how much of which vegetation type to strive for. It is also difficult to know the status of the various species to attempt to create favorable landscapes for the species most imperiled.

Because of the complicated nature of this issue, a reasonable goal is to strive for vegetative diversity, avoid a monoculture of any particular vegetation type, and avoid fragmentation of forests at a landscape level. These topics were addressed in Appendix C, Biological Assessment, and in other issues addressed in this EA such as *Issue 4, Vegetative Diversity Chapter 3-21*; *Issue 20, Old Growth Appendix A-10*; and *Issue 21, Fragmentation, Biodiversity, and Biological Corridors, Appendix A-11* (Tyers 1999, PF 175). Implementing any of the action alternatives will have a relatively limited affect on landscape vegetative patterns because of its small scale and, similalry, it will not facilitate creation of an unproductive monoculture in the Bear Creek drainage. Rather, it will add to the vegetative diversity in the analysis area by adding early seral stage vegetation to a drainage dominated by mature forests. There is no evidence it will compromise the viability of neotropic migratory bird species.

17. Raptors: The proposed timber harvest, road development, and post-harvest activities may affect raptors.

Eliminated due to minor or no effects. Effects to northern goshawks were addressed in *Appendix B, Biological Evaluation*. Impacts to the bald eagle were addressed in *Appendix C, Biological Assessment*.

Birds of prey are common throughout the analysis area. They are often seen in the lower sagebrush/ grasslands where rodents are plentiful and thermal air currents enhance flight. More secretive forest dwelling species are found in the higher, forested elevations.

At present, the proposed harvest units under all action alternatives are suitable habitat for species that require dense coniferous forests. Some nesting and foraging habitat for these species would be lost. However, for some species that forage in open areas, habitat would be gained. Less than 1% of the vegetative condition of the analysis area would be affected if any of the action alternatives are implemented. This does not represent a significant decrease in

suitable habitat for forest dwelling species or a significant increase for species that forage in open habitat. No nest sites are known to exist in the proposed harvest units. However, surveys (except for goshawks) have been limited. (Tyers 1999, PF 175).

18. Great gray owls: The proposed timber harvest, road development, and post-harvest activities may affect great grey owls.

Eliminated due to minor or no effects. Great gray owls are distributed holarctically across the boreal forests of North America and Eurasia. In North America this includes nearly all forested regions in Canada and Alaska, the upper mid-west and New England states in the U.S, and the subalpine and montane forests of the Cascade and Sierra Ranges and the Rocky Mountains. The population size in North America is unknown. In fact, no long term rigourous or standardized data are available for any regional or local breeding populations. In some areas, data on nesting densities are available. They demonstrate that great gray owls can, in some circumstances be comparatively abundant. The highest reported nesting density in North America is 1.88/km2 in Manitoba and northern Minnesota (Duncan and Hayward 1994, 155-175).

They rely on old hawk and raven sticknests or natural depressions on broken-topped snags or stumps for nest sites. They also utilize dearf-mistletoe clumps, cliffs, and readily accept artificial nest structures. Many studies have demonstrated that, in the southern part of their range, great gray owls nest in proximity to forest openings, including clear cuts and natural openings. Access to suitable forest openings for hunting may limit population densities. They prey upon relatively small prey including rodents, hares, and birds. They have been known to travel as much as 700 km in response to prey density variations (Duncan and Hayward 1994, 155-175).

There is no evidence that implementing any of the alternatives will be deleterious to great gray owl species-viability. The number of great gray owls in Bear Creek is unknown. However, this species is wide-spread across two continents and there appears to be sufficient reproduction to maintain or increase the North American population. Sightings occur across the GYA. They are potentially far-ranging and thus are able to relocate when displaced. In addition, preferred great gray owl habitat involves the juxtaposition of dense, mature forests for nesting and forest openings for foraging. Logging in Bear Creek would, therefore, create favorable spatial habitat arrangements, at least over the next several decades while the harvested areas are in an early seral stage. While timber removal would eliminate from 499 acres (Alternative B) to 195 acres (Alternative D-modified) of nesting habitat, it would conversely create the same number of acres of foraging habitat. Because 65% of the analysis area is forested, open areas for foraging are more likely a limiting factor for this species than nest sites (Duncan and Hayward 1994, 155-175).

19. Snag Habitat and Down Woody Debris: Timber harvest may negatively affect both snags and down woody debris by removing and altering these two important habitat components.

Eliminate due to effective mitigation and minor effects (Novak 1999, PF 159). See *Chapter 2-25, Mitigation Measures*.

Snag Habitat: Snags are standing dead trees that provide important habitat for feeding, nesting, and shelter for a variety of wildlife, invertebrates to a possible range of vascular and nonvascular plants and microorganisms. On the Gallatin National Forest, there are approximately 47 cavity dependent species of birds and mammals.

The number and size of available snags affect not only the presence or absence of snag dependent wildlife but also wildlife population levels. Each forest community supports a distinct combination of primary excavators and secondary cavity users. Furthermore, each species has distinct requirements in terms of the minimum diameter and height of the snags used for nesting and shelter.

Although snags are not a limiting factor, a small number, if any, snags or snag replacements were maintained in previously harvested areas in the Darroch-Eagle analysis area. Past harvest units are currently medium openings with insufficient habitat for snag dependent species. Forest Plan standards require that harvest units not scheduled for broadcast burning be designed to leave an average of 30 snags (greater than 18 ft. in height and greater than 10 inch DBH) per 10 acres (3 snags/acre equivalent), and an average of 30 live snag replacement trees (greater than 18

ft. in height and greater than 10 inch DBH) per 10 acres (3 replacement snags/acre equivalent). If there are not sufficient trees meeting this size criteria, the largest available trees would be left as snags. For Douglas-fir and subalpine fir on rocky or shallow soils, 60 trees per 10 acres would be designated as replacement trees (Forest Plan, Amendment 15). Snags will be distributed in leave islands or groups for safety purposes. For harvest units scheduled for broadcast burning, snags and replacement trees would be retained to the extent feasible. This standard would be met under all action alternatives.

Even with a lack of snags in some of the previously harvested stands, snag densities are high over most of the analysis area. Some snags resulted from mountain pine beetle infestations in lodgepole pine that occurred during the late 1970's, comandra blister rust which occurs presently, and the Ips beetle that infected some pine stands in the early 1990's. Many of the proposed harvest units contain high densities of 8-10" DBH snags.

Under Alternative A, there would be no direct impacts to snag density. However, over time, snag numbers would increase as trees die from insects and or disease.

The majority of timber proposed for harvest as a result of the action alternatives are live green trees that are generally diseased (mistletoe) and have the potential to be future snags. Some snags would also be harvested. As a result, snag densities would be reduced by the action alternatives although Forest Plan standards would be maintained. Areas adjacent to and surrounding most of the harvest units contain a high to moderate concentration of snags providing adequate wildlife habitat.

Cumulatively, snags would be reduced in lodgepole pine stands as a result of the proposed harvest activities and occasional ongoing personal-use firewood cutting in the analysis area. There is an increasing Douglas-fir bark beetle epidemic in the analysis area, which is creating additonal snags, however there is currently only light activity in the immediate project area.

Down Woody Debris: Logs and other coarse woody debris on the forest floor and in associated aquatic ecosystems fulfills a wide variety of ecological functions. These include habitat for a large variety of vertebrate, invertebrate, plant, fungal, and microbial species; sites for biological fixation of nitrogen; and long-term sources of organic matter and nitrogen. Decaying logs are centers of biological activity, including not only decay organisms, but also roots, mycorrhizal hyphae, nitrogen-fixing bacteria, amphibians and small mammals. After disturbance, logs reduce erosion by acting as physical barriers to soil movement and provide cover for small mammals that disseminate mycorrhizal spores from intact forest into the disturbed area The Forest Plan standard for dead and down woody debris (Amendment 15) is to leave a minimum of 15 tons per acre of 3 inch diameter or larger debris scattered after machine site preparation and/or hazard reduction within harvest units. Down woody debris to leave after project completion includes logs at various stages of decomposition. A minimum of two logs per acre (at least 10 inches in diameter and 20 feet long) in log class 1 and 2 (little decay has begun with these class logs) are to be left along with most if not all class 3, 4 and 5 logs (these logs are much higher levels of decay). For harvest units scheduled for broadcast burning, snags and replacement trees would be retained to the extent feasible. Where machine piling is specified, windrowing of dead and down woody debris would be prohibited. Down woody debris habitat is important to species utilizing vole as prey (goshawk, marten and owls) and will need to be retained after harvest to allow these species to use the area for foraging.

Over time, down woody debris would increase with Alternative A (No action). This would provide habitat and foraging areas for some wildlife but would also increase fuel loading, therefore increasing the potential for a large catastrophic fire. Large, hot fires can have the following deleterious effects: 1) remove much of the surface organic matter where organic matter is limiting, 2) reduce infiltration rates and increase surface runoff which can lead to erosion, 3) reduce the amount of nutrients such as N, Ca, K, P, Cl, Mg on site via volatilization and 4) kill most meso- and microfauna (such as mites, springtails) in the upper soil layers.

Action alternatives would maintain 15 to 25 tons per acres of down woody debris of greater than 3" diameter. Areas that are burned may reduce fuel levels but would leave at least 15 tons per acre. Down woody debris would likely increase in all harvested sites after logging is complete (but the number of existing standing dead trees would be reduced through harvest). However, the down logs currently there would be disturbed as the logging operation

occurs. Such disturbance can be harmful to existing plants and animals using the higher class level of decayed logs (3-5) for habitat. To mitigate for this possible problem, portions of the forest floor would be left undisturbed during the logging operation.

Regarding cumulative effects, down woody debris would likely increase as a result of harvest activities proposed, but the numbers of standing dead trees would be reduced within the harvest areas. However, past harvest activities have left only small amounts down woody debris. Some down woody material found in unlogged areas is proposed to be managed in the future by prescribed burns that may reduce the probably of a catastrophic fire event

20. Old Growth: The proposed timber harvest and clearing for road construction may require cutting and removal of old growth trees. This would reduce the amount of old growth trees in the area and may affect old growth-dependent wildlife.

Eliminated due to known minor or no effects. The analysis area is Compartments 305 and 306. This area is 52,608 acres, of which 34,672 are forested. The TSMRS database was queried through ArcView to calculate the acres of old growth timber, based on the best stratum attribute. Currently, the analysis area contains 20,255 acres of old growth forest. This is 38.5% of the total compartment acres and 58.4% of the forested acres within the compartments. Map E-7 shows the spatial distribution of the old growth. See Table A-1 below for the amount and percentages of old growth by alternative.

Table A-1. Old growth within Compartments 305 and 306.

Item	Alternative A (No Action)	Alternative B (Proposal)	Alternative C	Alternative D	Alternative D-Modified
Old growth harvested (ac)	0	352	312	231	173
Old growth remaining (ac)	20,255	19,903	19,943	20,024	20,082
Percent of **compartment** acres that are old growth	38.5%	37.8%	37.9%	38.1%	38.2%
Percent of **forested** acres that are old growth	58.4%	57.4% (-1.0%)	57.5% (-0.9%)	57.8% (-0.6%)	57.9% (-0.4%)

Alternative B would result in 37.8% of the total compartment acres and 57.4% of the forested component of the compartments remaining as old growth. Alternative C would result in 37.9% of the compartments and 57.5% of the forested component of the compartments remaining as old growth. Alternative D would result in 38.1% of the total compartment acres and 57.8% of the forested component of the compartments remaining as old growth. Alternative D-Modified would result in 38.2% of the total compartment acres and 57.9% of the forested component of the compartments remaining as old growth.
Alternative G, No Harvest of Old Growth, was considered in addressing this issue. See *Chapter 2-35, Alternatives Considered but Eliminated from Detailed Study*.

The percent change in old growth caused by each action alternative, in conjunction with past harvesting, is 1% or less of the forested component. This change in the resource is minor. Also, this slight reduction in old growth would be concentrated in areas already fragmented by past harvesting. This would minimize reduction of interior or core old growth habitat. None of the action alternatives would cause a significant impact on the old growth resource or old growth habitat . See additional discussion of effects to old growth dependent species under their respective issue.

Based on previous old growth forest analyses conducted throughout the Gallatin National Forest within the last 5 to 7 years, it is estimated that there is an approximate average of 40% old growth forest on lands identified as forested within the Gallatin Forest boundaries. A few compartments within the Gallatin National Forest have old growth totals on forested lands around 10%. However, many of the compartments within the roadless/wilderness areas (of which there are many) have old growth totals exceeding 60% for forested lands.

Analysis of vegetative diversity shows a mix of successional stages and patterns of vegetation (Table A-2). The proposed project would cause little change

Other predicted human activities in the analysis area are almost exclusively different forms of dispersed recreation. These activities, in combination with this proposal, will not deplete the existing range of species. Dispersed recreation along with this project would have little or no effect on the amount and distribution of vegetation types that maintains the current variety of species (Tyers 1999, PF 175 & 176). (See *Issue 4,.Chapter 3-21 Vegetative Diversityand Issue 27, A-22. Recreation Use*)

Table A-2. Vegetative diversity by alternative.

Item	Alternative A (No Action)	Alternative B (Proposal)	Alternative C	Alternative D	Alternative D-Modified
Grass/Forb (natural)	13,278 (25.2%)	13,278 (25.24%)	13,278 (25.24%)	13,278 (25.24%)	13,278 (25.24%)
Grass/Forb (harvested)	39 (<1%)	488 (0.92%)	422 (0.80%)	305 (0.58%)	214 (0.41%)
Seedling	73 (<1%)	73 (0.14%)	73 (0.14%)	73 (0.14%)	73 (0.14%)
Sapling	1,804 (3.4%)	1,804 (3.4%)	1,804 (3.43%)	1,804 (3.43%)	1,804 (3.43%)
Pole	168 (<1%)	168 (0.32%)	168 (0.32%)	168 (0.32%)	168 (0.32%)
Mature	12,333 (23.4%)	12,266 (23.32%)	12,272 (23.33%)	12,308 (23.40%)	12,331 (23.42%)
Old Growth	20,255 (38.5%)	19,903 (37.83%)	19,943 (37.93%)	20,024 (38.07%)	20,082 (38.17%)

*** Figures are acres and % of total compartment acres (52,608) after implementation of the alternative):**

21. Fragmentation, Biodiversity, Biological Corridors: The proposed timber harvesting and road construction may have an impact on biodiversity. Biodiversity is a concept that can be interpreted in various ways and described through several types of analysis. In this context, it addresses the variety and variability of living organisms and the ecological complexes where they are found. The Forest Plan provides little guidance in dealing with this issue. Biodiversity is indirectly addressed by standards designed to maintain a wide range of species and types of habitat. Examples include standards for conservation of threatened and endangered species, management indicator species, vegetative structure (old growth and vegetative diversity), big game, nongame and small game. In addition, species classified as sensitive (species of special concern) by the Regional Forester are considered in effects analysis.

In the Forest Plan, certain groups of species are used to represent a much wider range of species that have common habitat requirements. This allows for many species and types of habitat to be at least considered indirectly in effects analysis. For example, pine marten, a management indicator species, represents wet old growth spruce-fir forests and all the species that use that type. The Forest Plan requires that the habitat needs of pine marten are met. It can be argued that this approach meets the philosophy of addressing biological diversity.

The biological diversity of an area can be affected by fragmentation of habitat and disruption of biological corridors. Portions of a population can be isolated when vegetation patterns are fragmented and corridors for movement are truncated. In some situations, the viability of a species is jeopardized because there is insufficient genetic material or numbers of individuals to sustain a population. This can occur at various spatial scales, depending on how mobile a species is and what its habitat requirements are.

Eliminate due to known minor or no effects. The issue of impacts to biological diversity has been addressed indirectly for this project through various documents and processes of analysis. The *Biological Assessment (Appendix C)* addresses impacts to threatened and endangered species. One of these, the grizzly bear, is also a Forest management indicator species. The *Biological Evaluation (Appendix B*) deals with sensitive species. Ungulate migration routes are discussed in *Chapter 3-12, Ungulates*. Various agency documents that form the

project record deal with species and habitat types identified through scoping or that are singled out for analysis in the Forest Plan. An Environmental Assessment is a synthesis of effects analyses and thus deals with the concept of biological diversity.

With a few exceptions, Forest Plan standards are being met in the design of this project. This, in concept, ensures the maintenance of biological diversity by addressing the habitat needs of various representative groups of species. In addition, the project would not result in the disruption of biological corridors. It is not large enough in scope to affect corridors at a landscape level. A display of existing vegetation patterns demonstrates that biological corridors at a drainage level would also be maintained. A matrix of old growth timber (*Map E-7*) would be retained that should meet the needs of species that function at a small spatial scale.

22. Water Quality, Water Yield, Stream Condition: The proposed harvest, road development, and post-harvest activities may affect water quality (sedimentation), water yield, and stream condition.

Eliminated due to effective mitigation and minor effects. See detailed discussion below (from Story 1999 and 2003).

Bear Creek below the AB Wilderness boundary is designated by the Montana DEQ as a B1 stream for water quality standards. This portion of Bear Creek is listed as slightly impaired for flow and thermal modification, which would not be affected by any of the sale related activities. The TMDL is scheduled to be completed in 2005 by the Montana DEQ. The most limiting beneficial use is fishery habitat and sediment, which is defined by the Gallatin National Forest sediment standards for a stream category B (regionally/locally significant fisheries) are an annual increase limit of 50% and a cumulative 20 year annual limit of 500% over natural. Cumulative sediment yields were accumulated from 1980-1999 but adjusted for 2000-2004 for the preceding consecutive 20 year period.

The B1 designation requires waters to be suitable for drinking, culinary, and processing purposes after conventional treatment. The 2002 Montana 303(d) list includes Bear Creek below the Darroch-Eagle Creek timber sale boundary as described below in the Montana DEQ 303(d) website site at http://www.deq.state.mt.us/ppa/mdm/303_d/303d_information.asp.

Waterbody: MT43B002_021 - Bear Creek(River) - 3.1 Miles	**Map Waterbody**
Waterbody on year 2002 303d list?: Yes	**Assessment Record Sheet**

Description:	BEAR CREEK, 1/2 mi. below Jardine Mine to mouth (Yellowstone R)		
EcoRegion(s):	Middle Rockies	**Hydro Unit:**	10070001
County(s):	PARK	**Basin:**	Yellowstone
		Watershed:	Upper Yellowstone

Use Support

Beneficial Uses:	Fully	Threatened	Partial	Not Supporting	Not Assessed
Agriculture	**X**				
Aquatic Life Support			**X**		
Cold Water Fishery - Trout			**X**		
Drinking Water Supply	**X**				
Industrial			**X**		
Primary Contact (Recr)			**X**		

Probable Causes:
Flow alteration
Thermal modifications

Probable Sources:
Hydromodification
Flow Regulation/Modification

Beneficial uses must be maintained, the most limiting of which is the trout fishery in Bear Creek and its tributaries.. Sediment modeling used the R1R4 model. Modeling was done on a cumulative basis for the entire Bear Creek watershed at the confluence with the Yellowstone River. The R1R4 model was also run for Darroch Creek since it contains Yellowstone Cutthroat trout.

Gallatin National Forest sediment standards for a stream category B (regionally/locally significant fisheries) are defined as an annual increase limit of 50% and a cumulative 20-year annual limit of 500% over natural. Alternative B would have sediment yields that are projected to increase to 7.8% over natural (2.2% over 2003) by 2005 after the new road construction and timber harvesting is implemented. By 2008 sediment yields would drop to an estimated 5.8% over natural as harvested areas revegetate and constructed roads are obliterated. Alternative C and D have less sediment increase from road construction and harvesting but have the same sediment yields by 2008 since fewer roads (1.0 mile instead of 2.0 miles for Alternative B) would be obliterated. Alternative D-Modified has sedimentation potential reduced more than any of the other alternatives evaluated in the Darroch-Eagle timber sale EA except for the No Action. Alternative D-Modified would have sediment yields that are projected to increase to 6.3% over natural by 2005 and the levels would drop to 5.8% over natural by 2008, the same as the other action alternatives.

Table A-3 Results of R1R4 Sediment modeling for Bear Creek (yrs. 2003- 2008) for all alternatives

Alternative	Year	Natural Sediment tons/year	Timber Sediment tons/year	Road Sediment tons/year	Total Sediment tons/year	%Over Natural Sediment	Cumulative %Over Natural Sediment
A-No Action	2003	447	0	25.1	472.1	5.6	130
	2004	447	0	25.1	472.1	5.6	129
	2005	447	0	25.1	472.1	5.6	128
	2006	447	0	25.1	472.1	5.6	126
	2007	447	0	25.1	472.1	5.6	125
	2008	447	0	25.1	472.1	5.6	124
B	2003	447	0	25.1	472.1	5.6	130
	2004	447	2.5	27.7	477.2	6.7	130
	2005	447	3.8	30.0	480.8	7.8	131
	2006	447	4.4	27.7	479.1	7.2	130
	2007	447	3.2	25.2	475.4	6.4	130
	2008	447	1.9	23.9	472.8	5.8	129
C & D	2003	447	0	25.1	472.1	5.6	130
	2004	447	1.3	25.8	477.2	6.1	129
	2005	447	2.5	26.5	480.8	6.5	129
	2006	447	3.1	26.5	479.1	6.6	128
	2007	447	1.9	25.2	475.4	6.1	126
	2008	447	1.3	24.6	472.8	5.8	126
D-Modified (preferred)	2003	447	0	25.1	472.1	5.6	130
	2004	447	1.0	25.7	472.9	5.8	129
	2005	447	1.9	26.4	475.3	6.3	128
	2006	447	2.4	25.9	475.3	6.3	126
	2007	447	1.6	25.4	474	6.0	125
	2008	447	0.8	25.2	473	5.8	124

In Darroch Creek, Alternative B would result in a 1.1% increase (from 2.9 over natural currently to a maximum of 4.0% over natural in 2005). Alternatives C and D projected sediment increase in Darroch Creek would be a 1% increase (from 2.9 to 3.9% over natural). Alternative D-Modified projected sediment increase in Darroch Creek would be a .8% increase (from 2.9 to 3.7.

Table A-4 Results of R1R4 Sediment modeling for Darroch Creek (yrs. 2003- 2008) for all alternatives

Alternative	Year	Natural Sediment tons/year	Timber Sediment tons/year	Road Sediment tons/year	Total Sediment tons/year	%Over Natural Sediment	Cumulative %Over Natural Sediment
A-No Action	2003	87	0	2.6	89.6	2.9	79
	2004	87	0	2.6	89.6	2.9	76
	2005	87	0	2.6	89.6	2.9	74
	2006	87	0	2.6	89.6	2.9	73
	2007	87	0	2.6	89.6	2.9	71
	2008	87	0	2.6	89.6	2.9	70
B	2003	87	0	2.6	89.6	2.9	79
	2004	87	0.6	2.6	90.2	3.7	76
	2005	87	0.9	2.6	90.5	4.0	76
	2006	87	0.6	2.6	90.2	3.6	75
	2007	87	0.4	2.6	90.0	3.4	73
	2008	87	0.2	2.6	89.8	3.2	72
C & D	2003	87	0	2.6	89.6	2.9	79
	2004	87	0.6	2.6	90.2	3.7	76
	2005	87	0.8	2.6	90.4	3.9	76
	2006	87	0.5	2.6	90.1	3.6	75
	2007	87	0.4	2.6	90.0	3.4	73
	2008	87	0.2	2.6	89.8	3.2	72
D-Modified (preferred)	2003	87	0	2.6	89.6	2.9	79
	2004	87	0.4	2.6	90	3.4	76
	2005	87	0.6	2.6	90.2	3.7	75
	2006	87	0.4	2.6	90	3.4	74
	2007	87	0.2	2.6	89.8	3.2	72
	2008	87	0.1	2.6	89.6	3.1	71

Alternative D- modified (preferred) modeling estimates Darroch Creek sediment would increase by an estimated 0.7% and Bear Creek by 0.5%, less than Alternative B which estimated a 2.2% sediment increase in Bear Creek and a 1.1 % sediment increase in Darroch Creek and also less than the a 1.0% sediment increase in Bear Creek and 1.0 % sediment increase in Darroch Creek estimated for Alternative D in the EA. For all alternatives the sediment changes modeled would not be measurable with standard sediment monitoring techniques (width depth integrated DH48 samples and Helly-Smith bedload samples regressed against discharge) and would not pose geomorphic problems with accumulations in stream channels. For each alternative Bear Creek would meet the sediment guidelines for both the 50% annual and the 20 year cumulative 500% over natural and Darroch Creek would meet the category A standards of 30% annual and 20 year cumulative 300% over natural. Additional foreseeable future activities (personal use firewood, local use small sales, precommercial thinning, noxious week treatment, dispersed recreation) are not expected to measurably affect sediment yields. Some sediment reduction is occuring with closure of the Mineral Hill mine. A major unknown in future water quality would be a potential occurrence of a large wildfire which could increase sediment considerably in excess of the minor incremental levels anticipated with the Darroch-Eagle Creek timber sale.

The existing estimated water yield of 80,000 acre-feet/year includes approximately 250 acre-feet of existing water yield (0.3% above baseline) due to existing harvest units and roads. Alternative B would increase water yield the most, with an additional 77 acre-feet to 327 acre-feet above baseline (0.4 measurable levels and pose no concern with stream channel scour,. Alternative D-Modified (preferred) would increase water yield the least of the action alternatives, by an additional 33 acre-feet to 283 acre-feet above baseline (0.35%). All of the alternatives would have water yields that are considerably below measurable levels and pose no concern with stream channel scour, particularly considering the stable and coarse textured nature of the Bear Creek channel system.

Due to the limited level of anticipated water quality impacts, no water quality monitoring is anticipated specifically for the Darroch-Eagle Creek Timber Sale.

The Darroch-Eagle Creek sale is expected to meet the Gallatin NF sediment standards, State of Montana Water Quality standards, Montana Forestry BMP's, and SMZ rule provisions. The sale is expected to comply with all of the B-1 numerical standards and not conflict with downstream beneficial uses (agriculture, irritation, domestic, and cold water fishery) (Story 1999, PF 169 & 170)). All alternatives would comply with BSL Planning Criteria 1, 5, 7, and 9. See *Chapter 2-25, Mitigation Measures* and *Appendix D, Best Management Practices*.

23. Aquatic Resources: The proposed timber harvest and associated road work and other activities may affect fish habitat by increasing sediment yield, harvesting within riparian areas, and increasing water yield. These three subissues are discussed in detail below.

Sediment effects on fish habitat and populations: Timber harvest activities, including construction of roads and log landings disturb soils and increase potential for erosion and sediment transport to area streams. Increased fine sediment in streams has been shown to reduce habitat quality and cause adverse effects to fish and other aquatic biota.

Riparian harvest effects on fish habitat and populations: Large trees in mountain streams are a critically important source of habitat and food for stream dwelling biota, especially fish. Harvest of riparian trees reduces the potential to recruit trees into stream channels.

Watershed hydrologic changes and subsequent effect on fish habitat and populations: Timber harvest can increase water yield and the magnitude or duration of peak flows by altering a variety of hydrologic processes. This hydrologic imbalance may adversely affect aquatic habitat through increased scour potential, channel incision, bank erosion, and increased sediment transport capacity.

Eliminated due to effective mitigation and minor or no effects. See detailed discussion below (from Shuler 1999, PF 168).

Affected Environment:
Table A-5 below describes the class and conditions of the major streams in the project area. Bear Creek and the North Fork of Bear Creek support relatively diverse and abundant sport fisheries comprised mostly of resident Yellowstone cutthroat trout with fewer rainbow, brown and brook trout and mountain whitefish. The lower reach of Bear Creek (i.e., from the old Powerhouse downstream) is also an important spawning reach for Yellowstone River cutthroat trout. Genetic analysis of Yellowstone cutthroat trout in Bear Creek, the North Fork of Bear Creek and the East Fork of Bear Creek was completed in 1986. Results confirmed a high degree of introgression with rainbow trout, which were first stocked in Bear Creek in 1958 by the Montana Department of Fish, Wildlife and Parks. Population surveys done during summer of 1998 in Darroch Creek near the proposed harvest units revealed the presence of rainbow and hybrid cutthroat trout in moderate densities. Fish that appeared to be pure were analyzed and results verified genetic purity of that fraction of the fish assemblage. In time, all YCT in Darroch Creek are expected to be introgressed with non-native trout unless other management actions (e.g., construction of a permanent barrier and removal of non-native fish) can be implemented to reverse the introgression.

Because of the presence of genetically pure Yellowstone cutthroat trout, Darroch Creek is considered a Class A stream. Forest Plan implementation guidelines are more protective for Class A streams in terms of habitat management goals and objectives (Table A-6), and acceptable levels of habitat degradation. All streams that support genetically pure YCT are considered Class A and are to be managed at a level of at least 90% of their inherent habitat potential according to Forest Plan Implementation Guidelines. Bear Creek is also considered a Class A stream because it provides recruitment to the Yellowstone River, a Blue Ribbon trout fishery. The North Fork of Bear Creek is considered a Class B stream which supports a fishery with regional or local significance. Class B streams support populations with a capacity to sustain a quality recreational fishery. The population objective for a Class B stream is to maintain or enhance the existing catchable population and maximize the number of fish over 10 inches in length. The habitat management objective for Class B streams is to provide habitat at a

level which is at least 75% of potential habitat capability.

Direct and Indirect Effects

Sediment Effects: Table A-6 summarizes changes in sediment by alternative.

Table A-5. Management interpretations of channel types surveyed in analysis area streams.

Streams	Stream Types	Channel Sensitivity[a]	Recovery Potential b	Sediment Supply[c]	Bank Erosion Potential	Vegetation Controlling Influence[d]
Darroch Cr	A1	very low	excellent	very low	very low	negligible
Darroch Cr N. Fk. Bear Cr Bear Cr	A2	very low	excellent	very low	very low	negligible
Lower Bear Cr N. Fk. Bear Cr	B2	very low	excellent	very low	very low	negligible
Upper Bear Cr	B3	low	excellent	low	low	moderate

[a] Includes increases in streamflow magnitude and timing and/or sediment increases

[b] Assumes natural recovery once cause of instability is corrected

[c] Includes suspended and bedload from channel derived sources and/or from stream adjacent slopes.

[d] Vegetation that influences width/depth ratio stability

Table A-6. Existing and Estimated Sediment Yield and Retention in Spawning Gravels for Bear Creek. Sediment yield figures represent the high value through year 2004 (from Story 1999).

Alternative	Sediment Yield (%) over Natural Annual	Sediment Yield (%) over Natural 20-yr Cumulative	Incremental Change .24(x)	Sediment Concentration (%) in Spawning Gravels[a]
Alternative A (No Action)	5.6	130	0	17.80 (from 1991 data)
Alternative B (Proposed Action)	7.8	130	0.53	18.33
Alternative C	6.6	130	0.24	18.04
Alternative D	6.6	130	0.24	18.04
Alternative D-Modified	6.3	130	0.17	17.97

[a] Sediment concentration in spawning gravel estimated using the equation y=17.8 + .24(x) developed from measured fine sediment (particles <6.3mm) in spawning gravels versus predicted sediment yield increases from the R1/R4 model. The (17.8) is used as the y-intercept because it represents measured fine sediment concentrations rather than the (21.7) y-intercept that represents the average sediment concenentration for Gallatin NF streams used to develope the relationship.

Alternative A (No Action): Without timber harvesting, there would be no sediment increases over existing conditions related to this sale. Therefore, Alternative A would result in *No Impact* to the resident trout population or the fluvial adult spawners from the Yellowstone River.

Alternative B (Proposal): For this alternative, predicted sediment increases in spawning gravel will have *No Impact* because existing sediment concentrations are low and estimated increases do not cause concentrations to exceed the 90% habitat objective. Also, the channel types are resilient to sediment increases and increases are expected to be minor.

Alternative C: Estimated sediment increases for Alternative C are slightly lower than for the proposed action. However, the relative magnitude and direction of change is not different than alternative B. Therefore, for this alternative, the predicted sediment increases would have *No Impact* because the channel types are resilient to sediment increases and increases are expected to be minor.

Alternatives D & D-modified: Estimated sediment increases for these alternatives are slightly lower than for the proposed action and Alternative C. However, the relative magnitude and direction of change is not different. Therefore, for these alternatives, the predicted sediment increases would have *No Impact* because the channel types are resilient to sediment increases and increases are expected to be minor.

Riparian harvest:
Alternative A (No Action): For the no action alternative, no harvest is proposed so *No Impacts* would occur.

Alternatives B, C, D, & D-modified: To be in compliance with Forest Plan standards and BSL timber sale criteria, no riparian or SMZ harvesting is proposed. Therefore, there will be no riparian harvest effects and *No Impacts* would occur from any of the action alternatives.

Hydrologic effects:
Alternative A No Action): For the no action alternative, there is no potential to alter hydrologic balance beyond existing conditions and therefore *No Impact* would occur.

Alternative B (Proposed Action): This alternative would increase water yield an additional 0.1% (0.4% over baseline). The estimated 0.4% water yield increase over natural conditions would be considerabley below measurable levels and would not result in stream channel scour. Existing channel stability ratings and habitat survey data suggest that channel changes via hydrologic imbalance (e.g., bank erosion, scour, changes in channel morphology) from previous timber sales is not occurring and channels show no signs of alteration (Story 1999, PF 169 & 170). Furthermore, all channel types within the analysis area have very low sensitivity to changes in streamflow or sediment discharge. In addition, the silvicultural prescriptions call for partial cuts in most of the units, which leaves varying percentages of trees to offset potential flow increases and related habitat effects. Thus, the determination is that there is no potential to alter hydrologic balance or cause habitat degradation and *No Impact* would occur.

Alternatives C, D, & D-modified: Estimated hydrologic changes for Alternatives C, D, and D-Modified would be slightly lower than for the proposed action. However, the relative magnitude and direction of change is not different. Therefore, the predicted hydrologic changes caused by these alternatives would have *No Impact* because the channel types are resilient to streamflow increases and increases are expected to be minor.

Cumulative Effects
Sediment: Estimated sediment yield increases account for all previous timber sale, mining, and road building activities. Other reasonably foreseeable future activities are not expected to contribute measurable levels of sediment to area streams. The ongoing reclamation of the Mineral Hill Mine site should continue to reduce sediment delivery. Thus, cumulative sediment related impacts are expected to be within sediment guidelines and habitat management objectives and result in *No Impact* for all action alternatives.

Hydrologic Effects:
Cumulative basal area reductions from past, present, and reasonably foreseeable future harvest in the Bear Creek watershed, including this proposed sale, are much less than those found in the literature that caused measurable increases in flow. Most previous harvest occurred in the early 1970's and 1980's and many cutting units are revegetated with sappling sized trees that are at or nearing the heartwood development or water limited stage. Furthermore, the water yield effects analysis conducted by Story (1999, PF 169) included all past harvest activities. Thus, *No Impact* is anticipated for any of the action alternatives (Shuler 1999, PF 168). All alternatives would comply with BSL Planning Criteria 6, 7, and 8. See *Chapter 2-25, Mitigation Measures*; *Appendix B, Biological Evaluation*; and *Appendix D, Best Management Practices*.

24. **Soils Compaction, Productivity, Stability:** Ground disturbing activities associated with timber harvest and reforestation (skidding, yarding, slash treatment, site preparation) could have long-term negative effects on soil productivity, instability and compaction.

Summary
Soils in the activity area are medium textured with many rock fragments. They have moderate productivity and low landslide hazard. The primary potential detrimental effect on soil productivity is from soil disturbance during tractor or forwarder logging operations. Cable and helicopter operations have little effect on soils. The primary detrimental disturbance on the Gallatin Forest is displacement and compaction. Using the Regional soil protection guidelines, soil disturbance can be kept below 15% of a harvest area by using the Gallatin Forest Best Management Practices (BMP's) for tractor harvest, as long as there has not been significant previous disturbance and unit slopes are less than 35 percent in gradient. Slopes in tractor units are all generally less than 30%. There are two units (13 and 15) that have previous disturbance. Use of current harvest quidelines should not significantly affect productivity in these units.

Data And Analysis
Soils: Based on the Soil survey and three field trips (ca 1995, ca 1999, and 2003) to the project area, the following soil characteristics were noted.

- Landslide hazard is low in the area. I saw no evidence of mass-wasting features or landscape factors that contribute to instability.
- The Eagle Creek units are in an area of moderately coarse to medium textured soils formed in glacial till derived from volcanic (rhyolitic) and granitic rocks. Soils range from very-gravelly silt loams to gravelly loams. These are soils of moderate productivity. Slopes in cutting units are 10-30%. There are boulders in the subsoil. Habitat type is ABLA/VASC. There are some old cut stumps in the area. The existing road is slightly eroded.
- The Darroch Creek units are in area of moderately coarse to medium textured soils formed in glacial till derived primarily from volcanic (rhyolitic) rocks. Soils are very-gravelly and very-cobbly loams. These are soils of moderate productivity. There are some boulders in the subsoil. Habitat type is ABLA/VASC. The existing road is slightly eroded.
-

Soil Survey Map units include: map sheets 59 and 60. Map units include 34-1C for Eagle Creek and 34-4B and 34-1C for Darroch Creek (Davis and Shovic, 1996.) These map units are described as containing soils similar to the above. Soils are somewhat more productive than those mapped, but otherwise similar in interpretations.
Based on these observations soil productivity is likely to be moderate in the cutting units. There are no high landslide hazards and if drained properly, roads should be of low erosion hazard.

Potential Soil Productivity Effects: The BMP's described below require the concentration of disturbance to prevent excessive area-wide soil impacts. The effects of dispersed skidding practices in the past contributed to the need for these BMP's and their development on the Gallatin National Forest (Shovic, H. F. and K. Birkeland, 1992; Shovic, H. F. and G. Widner, 1991.) These studies showed that on the Gallatin Forest, displacement and compaction were the primary detrimental effects on soil productivity, and that tractor harvest with dispersed skidding allowed created high proportions of detrimental disturbance. Data showed cable (skyline) harvest systems created little disturbance. Based on these data, the Gallatin guidelines were developed, by geometrically defining commonly sized (40 acre) harvest units, and calculating minimum skid trail spacing to keep average disturbance

below 15% when added to normal landing area. This was calculated only for slopes under 35%. Observations indicated tractor harvest on slopes greater than this produce high disturbance levels due to loss of traction.
Dispersed skidding practices using equipment with low ground pressure have been successful on Forests having deep layers of organic material and slash (broken branches.) This layer is from 6 to 20 inches deep and originates from existing organic layers plus slash from the harvest operation. It protects the soil surface from displacement and prevents compaction, and is a standard BMP on many Region-One Forests (Kuennen, L, et. al., May 2000.)
The situation is quite different on east-side Montana Forests. There is no deep litter layer (Davis, C. E. and H. F. Shovic. 1996.) Harvest activities leave much less slash because trees are smaller and they are more widely spaced than on more productive sites. (Kuennen, L, et. al., May 2000.) Since we cannot match the soil protection layers used on Idaho forests and their documented protective capabilities, we do not recommend any form of dispersed skidding on the Gallatin National Forest, until enough research is done to show that dispersed skidding with new kinds of equipment is not detrimental to soil quality. Preliminary data on recent local harvest operations show that when existing soil guidelines are not followed, even with tracked harvester equipment, excessive soil damage may occur (Shovic, H., 1999.)

Characteristics of Harvest Units: The following table shows, by unit, characteristics of harvest units for Alternative D and D-Modified (preferred alternative). These data are based on field trips (2003) to the site by the soil scientist (in particular to Unit 15), soil survey information, previous on-the-ground experience by the soil scientist in the area, 25 years of specialist work on two timber sales in the area, and on-site data gathered by the project silviculturist. Slopes were estimated from aerial photography. Harvest methods were taken from the sale area map. (t=tractor harvest, s = skyline.)

Table A-6 Soil characteristics of harvest units for alternatives D and D-Modified (preferred alternative)

Unit	Slope (%)	Harvest Method	Previous Dist. %	Post-Harvest Dist. %
1	0-35	T	0	< 15
1C	20-40	S	0	< 15
1B	0-25	T	0	< 15
1A	10-40	S	0	< 15
3	0-35	T	0	< 15
3A	0-20	T	0	< 15
4C	10-35	T	0	< 15
4A	10-35	T	0	< 15
4B	10-35	T	0	< 15
8	0-20	T	Possible thinning in 10% of unit	< 15
9	0-20	T	0	< 15
12	0-15	T	Firewood cutter activity	< 15
13	0-30	T	Partially thinned and logged 30 yrs ago.	> 15
14	0-25	T	0	< 15
15	0-25	T	Commercial thin 30 years ago; evidence of soil disturbance > 15%	> 15

Previous thinning in Unit 8 was non-significant in extent. Firewood cutting has occurred in most stands but is non-significant in terms of soil disturbance. Due to past harvest there is probably a decrease in soil productivity on Unit 15, based on this analysis. Using Unit 15 as a base, the other previously harvested unit (Unit 13) probably also has excessive previous disturbance (based on field trips and aerial photography analysis.) The previous commercial thinning in Unit 13 and 15 likely exceeds detrimental-disturbance guidelines at the present time. There is no practical way to reduce overall disturbance to levels less than regional guidelines in these units. However, the 1999 Regional Guidelines specify "In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the

conditions prior to the planned activity." Further clarification of the meaning of this statement is in a letter from the Regional Forester dated June 14, 2000 (2550 June 14, 2000.) He states:

> "It is not the intent of this supplement to prohibit entry into previously harvested areas, even if those areas do not meet soil quality standards as we currently define them. Rather, the intent is to ensure that current harvest activities do not exceed soil quality standards, while at the same time using the entry to implement restorative treatments that will move the site toward an improved soil quality condition."

This is the case here. The Gallatin Forest guidelines described in this document, are designed to keep detrimental disturbance below Regional levels (i. e. 15%), thus meeting the intent of the Regional guidelines as further interpreted by the Regional Forester.

Eliminated due to effective mitigation. Alternative A will have no effect on soils. Application of the mitigation measures listed in Chapter 2 would prevent a measurable decrease in soil productivity. Road construction for Alternatives B-D will permanently remove varying amounts of land from production (Alternative B, 9.7 acres; Alternative C, 4.4 acres; Alternative D, 2.9 acres,). Though these and other roads are to be closed after harvest, they will remain essentially non-productive because they are not being recontoured. Alternative D-modifed has no new permenant roads so will not permenantly remove any additional land from production. There are no significant cumulative effects on soil productivity from any of the alternatives (Shovic 1999, 2003) All alternatives would comply with BSL Planning Criterion 9.

25. Air Quality: Slash treatment by burning may adversely affect air quality in the area.

Eliminated due to minor or no effects: For all alternatives, air quality within the Darroch/Eagle Creek timber sale area will be maintained within the National Ambient Air Quality Standards, and other provisional requirements by the State of Montana Air Quality Rules (9/90). All of the Darroch/Eagle Creek timber sale area is classified under the Clean Air Act amendments of 1977 as a Class II Area including the adjacent Absaroka Beartooth Wilderness. The PSD procedures (Prevention of Significant Deterioration), as administered by the Montana Air Quality Bureau do not directly apply to the proposal since sources are temporary. The primary constraint of the air quality standards are to maintain ambient air quality within the National Ambient Air Quality Standards, and to maintain emissions from prescribed fire and slash burning within the guidelines and coordinated constraints of Montana Airshed 10 (for downwind community health purposes), as specified in the Montana Smoke Management Memorandum of Agreement (Story 1999). All alternatives would comply with BSL Planning Criterion 1.

26. Visual Quality: The proposed timber harvest and road development may affect visual quality. There is also a concern that this area may not meet Forest Plan standards for visual quality.

Eliminated due to effective mitigation and minor effects. See detailed discussion below (from Ruchman 1999, PF 161)

Forest Road 493 (Bear Creek Road) and the Bear Creek Trailhead are the primary viewing points of concern for this project.

Direct and Indirect Effects

Alternative B (Proposed Action): On the Darroch Creek side of this project, the majority of the proposed units would be located on slopes that are above the primary road, 493. From this viewer-inferior position along the road, none of the Darroch units would be readily visible due to the blocking effect of trees that line the road and the angle of the terrain that slopes uphill immediately from the edge of the road, with no possible observation points along the road where the viewer can stand back and get a better view of the proposed units. From the end of the road, Bear Creek Trailhead, a few vertical slivers of the units might be discernible as a more open texture, but this too will be horizontally foreshortened since units 2, 12, and 13 predominantly face west, with only small areas even slightly facing northwest. Unit 1 would be hidden from viewers at the trailhead by the ridge directly east and southeast of the trailhead. Thus, from these key viewpoints and corridors, the units proposed in the Darroch Creek area would

not be easily discernible to the average viewer and would meet the Forest Plan visual quality standard, VQO of Modification.

Parts of proposed units 2, 12 and 13 would be visible in the foreground and middleground, from non-key viewpoints, to dispersed hunters and other recreationists who wander through the area, along the hillsides and small meadow openings to the west or in any small openings along Trail 64. These units that are visible from the west side would appear as new openings, though some of the larger crowned older Douglas-fir trees would remain in the opening resembling, to some degree, some of the naturally occurring slopes in the area that are predominantly grass with a few scattered Douglas-fir trees. From this noncritical vantage point, some of the existing road benches may become more visible. Also visible from these viewpoints would be the edge feathering that would be done for mitigation, where a proposed unit abuts a solid tree edge that can be feathered (where a proposed unit abuts an already harvested and regenerating area, no feathering is possible).

In the Eagle Creek portion of this project, the proposed harvest units are not visible from any key viewpoints or corridors, and as such, will be meeting the Forest Plan Visual Quality Objective of Modification from all key viewing areas. Due to the vertical foreshortening of the terrain and the view-inferior position , none of the proposed units are visible from either the Eagle Creek Campground area not the road below or up to the gate. For observers along other non-key travel corridors, such as the logging roads in section 32 and 31, the logged units will appear as new openings, with stumps and some slash and some disturbed soil in the foreground, and in the short term, log decks and slash piles. There will be some clumps of trees remaining within the openings as well as some individual trees. Where there had been some more open lodgepole pine stands due to past thinning harvesting, those areas will look much more open, with only some clumps and individual trees remaining. For recreationists on Trail 60, also a non-key observation point, the proposed units 15 and 16 will be visible, though at that distance (a bit more than one mile) the remaining clumps and individual trees, as well as the feathered edges (where the proposed edges abut a solid tree cover that can be feathered) will be visible.

Alternative C: From a scenery point of view, there is only a negligible difference between this alternative and Alternative B. The small units that are not being included in this alternative are not visible from any critical observation points. Even as they are viewed from noncritical locations, they would not be visually dominant, especially since the prescriptions specify leaving 30% of the canopy, which would be scattered in clumps and individual trees, as well as along the feathered edges.

Alternatives D and D-modified: From a scenery point of view, Alternatives D and D-Modified would also have only a negligible difference between this and Alternatives B or C. That is because none of the proposed units, even in B or C were very discernible from any of the key observation points or corridors. These alternatives will be somewhat different in appearance to dispersed recreationists and viewers, both within Section 31 in the Eagle Creek portion as well as those viewers on the southeast-facing hillsides on or near Trail 64. To these viewers, the overall amount of openings and thinned areas, the combined visual effect of the existing harvested areas alongside the proposed ones, will have a smaller overall visual magnitude. Units in these alternatives tend to replicate more the smaller size of some of the other natural openings in the area.

Cumulative Effects

Taking into consideration the existing harvested units, the proposed harvest units with the accompanying integral mitigation measures, and any foreseeable future actions, both of these areas for all four action alternatives would still meet the Forest Plan standard for visual quality. See *Mitigation Measures in Chapter 2-25.*

27. Recreation Use, Including Commercial Recreation (Outfitting): The timber sale proposal could change conditions for recreationists in the drainage during the time of logging because the sounds associated with logging may carry and be heard by recreationists. Log hauling operations may also affect public safety with recreationists sharing the transportation system with logging trucks.

Eliminated due to effective mitigation and minor effects. See detailed discussion below (from Gardner 1999, PF 144). Also refer to Issue 30 below, *Public Safety - Traffic*.

Affected Environment:
The Bear Creek drainage supports a mix of recreation opportunities, from primitive backcountry opportunities to sight-seeing from motor vehicles. The largest share of recreationists that use this area come from the local communities. A wide variety of recreation activities occur in the area including: camping, hiking, hunting, fishing, mountain biking, motorbikes, all-terrain vehicles, snowmobiling, and cross-country skiing. This popular recreation area receives high recreation use on weekends during the months of June through October, but only moderate use during the weekdays as evidenced by use of the developed campsites and trailhead. Hunting is the most popular activity during the fall and use is considered heavy. The area receives some snowmobile use and a moderate amount of cross-country ski use during the winter months.

There are two developed camp sites located along the Bear Creek Road near the Darroch Creek portion of the project. The Eagle Creek Campground is located closer to Gardiner along the Jardine Road. These camp sites receive high use on summer weekends. The opportunity for dispersed camping also exists adjacent to the spur roads. The Bear Creek Trailhead is located at the end of the Bear Creek Road and is heavily used throughout the summer and fall by hikers, backpackers, and horsemen. The trail leads into the Absaroka Beartooth Wilderness. The Pine Creek Trailhead is located on the Bear Creek Road and has only light use in the summer and fall. In the winter it serves as a trailhead for an extensive trail system of cross-country ski trails and for snowmobiles.

Big game hunting is also a primary use in the Bear Creek drainage. Spring bear, elk, and deer hunting are major activities. Mountain biking is primarily restricted to roads in the drainage and is also aside to general camping. As previously mentioned, the Nordic ski trail system consists of over 15 miles of marked ski trails, 4 miles of which are groomed for skating and have track set. Use is considered to be fairly low especially during the weekdays. Maximum recorded use is between 200-250 skiers per week. The area supports a fair amount of snowmobiling, mostly by local residents, and mostly restricted to existing roads and old logging roads. Use is still considered to be light and sharing many of the same trails as the Nordic skiers does not seem to be a problem.

Four special use permits authorize summer horseback day rides on the national forest, but these rides generally don't get very near the proposed cutting units. There are two permits for spring bear hunting, and five permits that authorize both fall and winter elk hunting. Outfitted winter or late season elk hunts along with non-outfitted hunters constitutes the highest recreational use of the area. Traditionally, a permit has been authorized every winter for a cross-country ski race utilizing the Bear Creek ski trails. This permit is only for two days on a weekend.

Direct and Indirect Effects
All action alternatives would have an effect on recreationists in the analysis area. Alternatives offering less timber volume would, in general, have less effect than those offering more volume due to the higher level of logging traffic associated with higher the volume level. During the life of the timber sale (3 years) recreationists, both guided and unguided, could expect to encounter additional truck traffic (log trucks, heavy equipment, and service vehicles) on the main roads and spur logging roads. There would be noise and dust in the immediate vicinity of harvest units from sawyers, skidders, and loaders. The combination of noise, dust, and traffic may temporarily displace recreationists from active logging areas or developed sites along main roads. However, as long as logging activity remains restricted to weekdays of the summer months (a mitigation measure), the displacement would not be considered significant. See *Mitigation Measures in Chapter 2-25*.

Cumulative Effects
Additional activity along the Lower Bear Creek Road could cause concerns for conflicts with recreational and logging traffic, however this cumulative effect would likely occur along the county road system (Jardine Road), which generally has a wider travel surface and less recreation use occurring along it.

28. Wilderness: Chainsaws, logging traffic, and heavy equipment will generate noise which may be audible at certain locations within the southwest corner of the Absaroka Beartooth Wilderness. This has the potential to reduce the sense of apparent naturalness and solitude for wilderness users.

Eliminated due to known minor effects. Alternative A would have no effect on wilderness. Alternatives B-D-Modified would generate chainsaw and vehicle noise during the summer/fall operating season for up to three years. Alternative B would generate the most noise and Alternative D-Modified the least noise, based on the amount of acres to be harvested. The noise may be detectable for a short distance into the AB Wilderness near the Bear Creek Trailhead and in the lower portion of the North Fork of Bear Creek drainage. Overall, this would not be a significant effect, taking into account the cumulative effect of noise generated by personal use firewood cutting that would continue to occur in the area during the sale.

29. Roadless Areas: Chainsaws, logging traffic, and heavy equipment will generate noise which may be audible at certain locations within nearby portions of the North Absaroka Roadless Area (#1-371). This has the potential to reduce the apparent naturalness, remoteness, and solitude of the roadless area.

*D**ismissed due to irrelevance**:* Maps E-1 through E-4 show the existing Roadless Area boundary and the proposed harvest units and roads. These maps clearly show that no logging or road building would occur within the Roadless Areas. This issue has been dismissed because all harvest units and roads are located outside of inventoried roadless areas (Schlenker 1998). All alternatives would comply with BSL Planning Criterion 4.

30. Cultural Resources: Ground disturbance associated with the proposed harvest, road development, and post-harvest activities may damage or destroy cultural resources.

Eliminated due to no effect and effective mitigation. The project area has been surveyed for cultural resources several times over the past 20 years. The most recent survey was conducted during the summer of 1998 specific to this sale. No cultural resources were found as a result of these surveys. None of the alternatives will have any direct, indirect, or cumulative effects on cultural resources. Timber sale contract provision CT6.24# (Protection of Cultural Resources) will be included in the sale contract. See *Mitigation Measures* in Chapter 2-25 (Allen 1999, PF 135). All alternatives would comply with BSL Planning Criterion 1.

31. Public Safety - Traffic: Traffic on narrow, winding mountain roads associated with the proposed timber harvest, road development, and post-harvest activities may pose hazards to the public who will also be using the road system.

Eliminated due to effective mitigation. This concern is being addressed through the safety objectives in the road reconstruction standards. Also, the timber sale contract will contain safety provisions (C6.33 and C6.332#) to reduce risk of traffic accidents along the haul route. See *Chapter 2-23, Features Common to all Action Alternatives, Including Mitigation and Monitoring*.

32. Noxious Weeds: Ground disturbing activities associated with proposed timber harvest, road development, and post-harvest activities may provide the opportunity for establishment of noxious weeds. There is a concern that KV funds will not be available for noxious weed treatment.

Eliminated due to effective mitigation. Alternative A would not increase the risk of new weed infestations above current levels. Alternatives B through D-Modified would increase the risk of new infestations to varying degrees. The level of risk is commensurate with the amount of ground disturbance and vehicle travel in an area. Of the action alternatives, Alternative B would have the greatest risk and Alternative D-Modified the least risk. Mitigation and monitoring would reduce the impact and risk of new infestations to an acceptable, manageable level for all three alternatives. See *Mitigation Measures* and *Monitoring in Chapter 2-23* (Hoppe 1999,PF 146).

33. Silviculture - NFMA Requirements: The proposed timber harvest must be consistent with specific NFMA requirements (36 CFR 219.27) (e.g., vegetative manipulation, silvicultural practices, even-aged management). The proposal must also be consistent with Forest Plan standards.

Eliminated due to minor or no effect. Timber management consistency requirements (36 CFR 219.14 and 219.27) would be met for all action alternatives. See detailed discussion below (Novak 1999, PF 159 & 160).

a) Vegetative Manipulation 36 CFR 219.27(b): Planned harvesting meets the requirements for manipulation of tree cover. Of the three action alternatives, Alternative D-modified is best suited for the multiple-use goals of the area and the seven requirements listed under 36 CFR 219.27(b).

b) Silvicultural Practices 36 CFR 219.27(c): The proposed activities meet the requirements for harvesting timber on lands to meet the objectives of the Forest Plan. The proposed harvest treatments have been determined to be the optimum method for regeneration of the stands.

Reforestation objectives are reflected in stocking guides which establish ranges of stocking densities by habitat type and species. Minimum stocking levels range from 200 to 300 trees per acre, depending on the habitat type and site conditions. Densities below these in immature stands will neither produce the maximum per acre volume possible over a rotation nor provide adequate hiding cover for wildlife. Depending on the management objective, stands with more than 600 to 700 trees per acre may need thinning to reduce competition and maintain the growth rates expected in a young, managed stand.

Regeneration of a new forested stand can be assured on any unit proposed for harvest in the action alternatives. The knowledge, technology and expertise exist to adequately restock the lands managed for even-aged forests within five years after final harvest. The requirements for successful regeneration include: identification of site conditions, knowledge of the species requirements, knowledge of management implications of various site conditions and the proper application of appropriate harvest systems and post harvest cultural treatments.

Lodgepole pine stands proposed for silvicultural treatment would be partially stocked at completion of harvest activities due to the seedling, sapling, and intermediate size trees remaining on site. Natural regeneration of lodgepole pine has been relatively successful following regeneration harvest treatments.

Douglas-fir stands proposed for silvicultural treatment will be planted with three-year-old nursery seedling stock. Due to persistent feeding on cones and seeds by spruce budworm and warm to hot dry slopes, natural regeneration of Douglas-fir is often unpredictable.

Regeneration progress would be monitored in the first, third, and fifth years after planting and the second, fourth and fifth year for natural regeneration to determine if additional planting or cultural treatments would be necessary to achieve NFMA goals.

c) Suitability for Timber Production 36 CFR 219.14 and 219.27(c)(1): All timber harvesting would occur on lands classified as suitable for timber production (MA 13).

d) Even-aged Management 36 CFR 219.27(d): Alternative D and D-modified are consistent with 219.27(d)(2) regarding size of created openings. Alternatives B and C contain units which would exceed the 40-acre size limit.

34. Harvest Administration: There is concern that the Forest Service will not have control over the timber harvest operations because it is a "BSL" timber sale.

Eliminated due to effective mitigation or project design. This and all other BSL timber sales will be administered by the Forest Service through its normal timber sale contract procedures. Refer to *Chapter 1-3, Proposed Action* and *Chapter 2-23, Features Common to All Action Alternative, Including Mitigation* and *Monitoring*.

35. Environmental Justice: Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, and Departmental Regulation 5600-2 direct federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment.

Interested and Potentially Affected Parties:
Minority and low-income populations potentially affected by the project were identified as: 1) regional American Indian tribes and 2) a segment of the Gardiner community considered to be relatively low-income. The potentially affected tribes are: Confederated Salish and Kootenai Tribes, Crow Tribal Council, Shoshone Business Council, and Shoshoni-Bannock Tribe. The Crow tribe retains treaty rights (Fort Laramie Treaty) on the affected National Forest lands. The second group is primarily composed of entry-level, summer seasonal government and retail/service sector employees who work for Yellowstone National Park, its primary concessionaire (AMFAC), and small local businesses serving the recreation and tourist industry in Gardiner. These people are somewhat dependent upon local national forest lands for obtaining personal-use firewood, which is an economical fuel source for home heating.

Outreach:
The tribes were notified of the project proposal by: 1) a mailing of the Gallatin National Forest's Quarterly Project Listing and 2) the 5/20/98 scoping letter containing a description of the project and soliciting comment: The identified low-income group was notified of the project by listing it in the Gardiner Monthly Newsletter since June, 1998. The Newsletter is posted at numerous businesses and the post office in Gardiner. No comments or communications have been received from the tribes for the Darroch-Eagle Creek Timber Sale. Effect of the project on firewood availability was identified by the ID team as a relevant issue. It is Issue 5 in this EA *Chapter 3-23*.

Eliminated due to effective mitigation and minor effects. The environmental analysis shows this project will not cause a significant disproportionate environmental impact (including human health, social, and economic impacts) to minorities or low-income groups. Firewood availability will be reduced slightly but mitigation measures and project design should minimize this impact (See Chapter 2-25 and 3-23 discussions regarding Issue 5, Firewood Availability) (Kujawa 1999; U.S. 1994; USDA 1997).

36. Other Effects: The project would not affect social groups such as women and minorities. The project would not have impacts on prime farmland, rangeland, and forest land; and would not have impacts on floodplains and wetlands.

***Eliminated due to minor or no effects.*:** These issues require specific disclosure so are discussed briefly in *Chapter 3-27, Other Specifically Required Disclosures*.